

Amendments of the Claims

The following listing of claims will replace all prior versions, and listings, of claims in the above-identified patent application:

Listing of Claims

1-30. (canceled)

31. (withdrawn) A semiconductor manufacturing method comprising:

providing a semiconductor substrate having a photosensitive surface;

5 providing a semiconductor pattern mask comprising:

a mask substrate characterized by a first transmissivity to light,

10 a plurality of first features on said mask substrate for forming structures in a semiconductor pattern, each of said first features being characterized by a second transmissivity to light, and

15 a plurality of second features on said mask substrate, each of said second features being characterized by a third transmissivity to light;

exposing said photosensitive surface to light through said mask; and

20 processing said exposed photosensitive surface to develop said structures on said semiconductor substrate.

32. (withdrawn) The method of claim 31 wherein said first transmissivity is substantially opaque and said second transmissivity is substantially transmissive.

33. (withdrawn) The method of claim 31 wherein said first transmissivity is substantially transmissive and said second transmissivity is substantially opaque.

34. (withdrawn) The method of claim 31
wherein:

said third transmissivity is
substantially equal to said second transmissivity; and
5 each of said second features is smaller
than any of said first features, said second features
not forming structures in said semiconductor pattern.

35. (withdrawn) The method of claim 34
wherein:

each of said first features has
dimensions selected to be imaged by light having a
5 predetermined wavelength; and
each of said second features has
dimensions substantially less than said predetermined
wavelength.

36. (withdrawn) The method of claim 35
wherein each of said second features has dimensions of
between about one-third and about one-half of said
predetermined wavelength.

37. (withdrawn) The method of claim 31
wherein said second and third transmissivities differ
in relative phase.

38. (withdrawn) The method of claim 37
wherein each of said second features is at least
similar in size to said first features, said second
features forming structures in said semiconductor
5 pattern.

39. (withdrawn) The method of claim 37
wherein each of said second features is smaller than
any of said first features, said second features not
forming structures in said semiconductor pattern.

40. (withdrawn) The method of claim 31 wherein at least a subset of said first features are in a nonuniform repetitive pattern.

41. (withdrawn) The method of claim 40 wherein said nonuniform repetitive pattern is dense.

42. (withdrawn) The method of claim 40 wherein:

said third transmissivity is substantially equal to said second transmissivity;

5 said exposing comprises exposing said photosensitive surface to light having a predetermined wavelength; and

each of said second features has dimensions substantially less than said predetermined wavelength, said second features not forming structures in said semiconductor pattern.

43. (withdrawn) The method of claim 42 wherein each of said second features has dimensions of between about one-third and about one-half of said predetermined wavelength.

44. (withdrawn) The method of claim 40 wherein said second and third transmissivities differ in relative phase.

45. (withdrawn) The method of claim 44 wherein each of said second features is at least similar in size to said first features, said second features forming structures in said semiconductor pattern.

46. (withdrawn) The method of claim 44 wherein each of said second features is smaller than any of said first features, said second features not forming structures in said semiconductor pattern.

47. (withdrawn) The method of claim 40 wherein substantially all of said first features are in said nonuniform repetitive pattern.

48. (withdrawn) The method of claim 47 wherein said nonuniform repetitive pattern is dense.

49. (withdrawn) The method of claim 47 wherein:

said third transmissivity is substantially equal to said second transmissivity;

5 said exposing comprises exposing said photosensitive surface to light having a predetermined wavelength; and

each of said second features has dimensions substantially less than said predetermined wavelength, said second features not forming structures in said semiconductor pattern.

50. (withdrawn) The method of claim 49 wherein each of said second features has dimensions of between about one-third and about one-half of said predetermined wavelength.

51. (withdrawn) The method of claim 47 wherein said second and third transmissivities differ in relative phase.

52. (withdrawn) The method of claim 51 wherein each of said second features is at least similar in size to said first features, said second features forming structures in said semiconductor pattern.

53. (withdrawn) The method of claim 51 wherein each of said second features is smaller than any of said first features, said second features not forming structures in said semiconductor pattern.

54. (withdrawn) The method of claim 31 wherein at least a subset of said first features are in a dense nonuniform pattern.

55. (withdrawn) The method of claim 54 wherein substantially all of said first features are in said dense nonuniform pattern.

56. (withdrawn) The method of claim 54 wherein:

said third transmissivity is substantially equal to said second transmissivity;

5 said exposing comprises exposing said photosensitive surface to light having a predetermined wavelength; and

each of said second features has dimensions substantially less than said predetermined wavelength, said second features not forming structures in said semiconductor pattern.

57. (withdrawn) The method of claim 56 wherein each of said second features has dimensions of between about one-third and about one-half of said predetermined wavelength.

58. (withdrawn) The method of claim 54 wherein said second and third transmissivities differ in relative phase.

59. (withdrawn) The method of claim 58 wherein each of said second features is at least similar in size to said first features, said second features forming structures in said semiconductor pattern.

60. (withdrawn) The method of claim 58 wherein each of said second features is smaller than

any of said first features, said second features not forming structures in said semiconductor pattern.

61. (new) A semiconductor pattern mask comprising:

a mask substrate characterized by a first transmissivity to light; and

5 a plurality of features in a dense nonuniform repetitive pattern on said mask substrate for forming structures in a semiconductor pattern, said dense nonuniform repetitive pattern exhibiting three-fold symmetry; wherein:

10 each feature in a first portion of said features is characterized by a second transmissivity to light;

each feature in a second portion of said features is characterized by a third transmissivity to light, each feature in said second portion being different from each feature in said first portion; and

15 features in said second portion of said features are selected to be located relative to features in said first portion of said features such that said three-fold symmetry of said dense nonuniform repetitive pattern is broken.

62. (new) The semiconductor pattern mask of claim 61 wherein three-fold symmetry is broken without surrounding each feature in said first portion of said features with features in said second portion of said features.

63. (new) The semiconductor pattern mask of claim 61 wherein said first transmissivity is substantially opaque and said second transmissivity is substantially transmissive.

64. (new) The semiconductor pattern mask of claim 61 wherein said first transmissivity is

substantially transmissive and said second transmissivity is substantially opaque.

65. (new) The semiconductor pattern mask of claim 61 wherein:

 said third transmissivity is substantially equal to said second transmissivity; and
5 each feature in said second portion is different from each feature in said first portion in that each of said second features is smaller than any of said first features, said second features not forming structures in said semiconductor pattern.

66. (new) The semiconductor pattern mask of claim 65 wherein:

 each of said first features has dimensions selected to be imaged by light having a
5 predetermined wavelength; and
 each of said second features has dimensions substantially less than said predetermined wavelength.

67. (new) The semiconductor pattern mask of claim 66 wherein each of said second features has dimensions of between about one-third and about one-half of said predetermined wavelength.

68. (new) The semiconductor pattern mask of claim 61 wherein each feature in said second portion is different from each feature in said first portion in that said second and third transmissivities differ in
5 relative phase.

69. (new) The semiconductor pattern mask of claim 68 wherein each of said second features is at least similar in size to said first features, said second features forming structures in said
5 semiconductor pattern.

70. (new) The semiconductor pattern mask of
claim 68 wherein each of said second features is
smaller than any of said first features, said second
features not forming structures in said semiconductor
5 pattern.